
Staff Report

# USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT AMITRAZ

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# USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT AMITRAZ

## A. BACKGROUND

This recommendation contains general information regarding the physical-chemical properties and the historical uses of the pesticide *N*'-(2,4-dimethylphenyl)-*N*-[[(2,4-dimethylphenyl)imino] methyl]-*N*-methylmethanimidamide (amitraz). The Department of Pesticide Regulation (DPR) provides this information to assist the Air Resources Board (ARB) in their selection of appropriate locations for conducting pesticide air monitoring operations.

Amitraz (CAS: 33089-61-1) exists as colorless, odorless monoclinic needles. Amitraz has a molecular formula of $C_{19}H_{23}N_3$, and a molecular weight of 293.4 g/mole**.** It is soluble in water at room temperature, ca. 1 mg/L. It has a Henry's Constant of $1.48 \times 10^{-7}$ atm·m³/mol at 20–25 °C, and a vapor pressure of 0.051 mPa at 20 ºC. Amitraz is soluble in most organic solvents; it's solubility >300 g/L in acetone, toluene, and xylene.

Amitraz is stable to heat. The reported half-life in buffered aqueous solution (pH 7) is about 6 hours at 20°C. Ultraviolet light appears to have little effect on stability. In soil, amitraz decomposes rapidly under aerobic conditions; its half-life in soil < 1 day. Degradation occurs more rapidly in acid than in neutral or alkaline soils.

Amitraz's acute oral $LD_{50}$ is 800 mg/kg for rats, and >1600 mg/kg for mice. Its acute inhalation $LC_{50}$ (6 hours) for rats is 65 mg/L air. Its $LC_{50}$ (96 hour) is 2.7-4.0 mg/L for rainbow trout, and 1.3 mg/L for bluegill sunfish. It exhibits a low toxicity to bees and other predatory insects. Amitraz entered the risk assessment process at DPR under SB 950 (Birth Defect Prevention Act of 1984) based on potential oncogenicity, reproductive and mutagenicity effects.

## B. USE OF AMITRAZ

As of July 1, 1997, nine amitraz-containing products were registered for use in California. Three products are registered specifically for use on pears, two products are registered for use solely on cotton, and the remainder include tick collars for dogs, and livestock and livestock premises sprays. Amitraz is a nonsystemic diamidide insecticide and miticide with contact and respiratory action. Additionally, amitraz acts as a synergist for other cotton insecticides.

With DPR's implementation of full pesticide use reporting in 1990, all users must report the agricultural use of any pesticide to their county agricultural commissioners, who

subsequently forward this information to DPR. DPR compiles and publishes the use information in the annual Pesticide Use Report (PUR). Because of California's broad definition for agricultural use, DPR includes data from pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and rights-of-way, postharvest applications of pesticides to agricultural commodities, and all pesticides used in poultry and fish production, and some livestock applications in the PUR. DPR does not collect use information for home and garden use, most livestock use, or for most industrial and institutional uses. The information included in this monitoring recommendation reflects cropland applications of amitraz. Use rates were calculated by dividing the total pounds of amitraz reported used (where amitraz was applied to acreage) by the total number of acres reported treated.

Prior to 1994, field amitraz applications were limited largely to pears. In 1994, the two cotton-specific products became available. The use patterns reflect this change—the total 1990-1993 use averaged 6,000 lbs AI per year, while 1994 and 1995 total use increased to an average 74,000 lbs AI per year. Applications to cotton in four counties accounts for nearly all of the increase. According to the PUR, over 99 percent of California's total 1994 and 1995 amitraz use occurs in ten counties (Table 1). Historically, cropland applications account for over 99 percent of the total amount of amitraz reported used each year. According to the PUR, non-cropland applications—livestock premise and livestock sprays—account for less than one percent of the total amount of amitraz reported used each year. However, most livestock uses are not required to be reported in the PUR.

In California, growers use amitraz to control pear psylla in pears, and several insects in cotton including aphids, spider mites, and whiteflies, depending on location. In the San Joaquin Valley, aphids and mites represent the primary target pest; in Imperial Valley silverleaf whitefly is the most serious pest. Labeled use rates for amitraz range from 0.75 to 1.5 pounds active ingredient (AI) per acre in pears, and from 0.125 to 1 lb AI per acre in cotton. The highest label rates in pears are associated with pear psylla, while the highest label rates in cotton are associated with moderate to severe infestations of spider mites. Amitraz is formulated as either a wettable powder or an emusifiable concentrate. Amitraz-containing products include the Signal Word "Warning" or "Danger" on their labels, depending on the formulation or concentration of the product.

## Table 1. Annual Agricultural Use of Amitraz (Pounds of Active Ingredient)

| COUNTY | 1995 | 1994 | 1993 |
|---|---|---|---|
| Kings | 23,594 | 25,967 | 0 |
| Tulare | 16,985 | 18,719 | 18 |
| Kern | 15,204 | 9,824 | 0 |
| Fresno | 12,869 | 11,824 | 78 |
| Merced | 2,586 | 508 | 0 |
| Yuba | 2,526 | 978 | 2,688 |
| Madera | 846 | 744 | 0 |
| Lake | 673 | 98 | 187 |
| Mendocino | 552 | 545 | 992 |
| Imperial | 488 | 1,172 | 0 |
| County Totals | 76,323 | 70,379 | 3,963 |
| ***Percent of Total*** | ***99%*** | ***99%*** | ***81%*** |
| **CALIFORNIA TOTAL** | **77,198** | **71,153** | **4,877** |

According to the PUR, beginning in 1994, Kings County and Tulare County routinely receive the greatest applications of amitraz; where growers apply nearly 35 and 24 percent of all the amitraz used, respectively. Table 2 summarizes the total amounts and average daily rates of amitraz reported applied in Kings and Tulare Counties during the months of greatest use in 1994 and 1995. Prior to 1994, the highest amitraz use occurred in Yuba County, where approximately 1,500 lbs AI were applied during June each year.

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## Table 2. Amitraz Applications in Kings and Tulare Counties

| COUNTY | | 1995 | | 1994 | |
|---|---|---|---|---|---|
| | MONTH | *Lbs Used*[1] | *Rate*[2] | *Lbs Used*[1] | *Rate*[2] |
| Kings County | | | | | |
| | August | 13,568 | 0.5 | 19,879 | 0.6 |
| | July | 9,218 | 0.4 | 5,882 | 0.5 |
| Tulare County | | | | | |
| | August | 14,071 | 0.4 | 13,462 | 0.5 |
| | July | 2,722 | 0.4 | 5,124 | 0.6 |

[1] In pounds of active ingredient.
[2] Average rate (in pounds of active ingredient per acre).

In Kings County, the highest use occurs in August, and is associated with applications to cotton. Generally, growers apply amitraz during the middle to late part of the growing season, when severe aphid infestations can lead to significant losses in the yield or the quality of the cotton.

The highest reported rates of amitraz use occur at about 1.5 lbs AI per acre (the highest labeled rate), and are associated with summer applications to pears, primarily in Yuba County.

## C. RECOMMENDATIONS

### *1. Ambient Air Monitoring*

The historical trends in amitraz use suggest that monitoring should occur over a 30- to 45-day sampling period in the cotton growing regions in northern Kings County from mid-July through August. Figure 1 shows applications routinely begin in mid-July, reach a peak during the first week in August, then tail off throughout the remainder of the month. Figure 2 displays the areas of amitraz use by section in Kings County for 1994-1995. Amitraz was not registered for use on cotton prior to 1994. Amitraz is generally applied when aphid populations become high. Because amitraz is a contact insecticide, followup applications may be needed as aphid populations resurge. These multiple applications account for the excessive number of acres (i.e. >640 acres) reported treated for some sections.

DPR recommends close coordination with the county agricultural commissioner to select the best sampling sites and periods. Three to five sampling sites should be selected in relatively high-population areas or in areas frequented by people. Sampling sites should be located near cotton growing areas. Ambient samples should not be collected from samplers immediately adjacent to fields or orchards where amitraz is being applied. At each site, twenty to thirty discrete 24-hour samples should be taken during the sampling period. Background samples should be collected in an area distant to amitraz applications.

Replicate (collocated) samples are needed for five dates at each sampling location. Two collocated samplers (in addition to the primary sampler) should be run on those days. The date chosen for replicate samples should be distributed over the entire sampling period. They may, but need not be, the same dates at every site. Trip blank and field spike samples should be collected at the same environmental conditions (e.g., temperature, humidity, exposure to sunlight) and experimental conditions (e.g., air flow rates) as those occurring at the time of ambient sampling.

### *2. Application-Site Air Monitoring*

The historical trends in amitraz use suggest that application-site air monitoring should be conducted from mid-May through June in Yuba County in association with pre-harvest application to pears (Figure 3). Monitoring should occur at a site of highest rate of use—1.5 pounds AI per acre. Because amitraz applications are limited to three sections in Yuba County (Figure 4), DPR recommends close coordination with the county agricultural commissioner to select the best sampling sites and dates. Amitraz may be intensively applied in nearby pear orchards during this period so care should be taken to prevent nearby applications from contaminating collected samples.

A three day monitoring period should be established with sampling times as follows: application + 1 hour, followed by one 2-hour sample, one 4-hour sample, two 8-hour samples and two 24-hour samples. A minimum of four samplers should be positioned, one on each side of the field. A fifth sampler should be collocated at one position. Since amitraz is extensively used in the area, background samples should collect enough volume (either 12 hours at 15 liters/min, or a shorter period with a higher volume pump) to permit a reasonable minimum detection level. Ideally, samplers should be placed a minimum of 20 meters from the field. Trip blank and field spike samples should be collected at the same environmental conditions (temperature humidity, exposure to sunlight) and experimental conditions (similar air flow rates) as those occurring at the time of sampling.

Additionally, we request that you provide in the monitoring report: 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles; 3) meteorological data collected at a minimum of 15-minute intervals including wind speed and direction, humidity, and air temperature, and comments regarding degree of cloud cover; and 4) the elevation of each sampling station with respect to the field, and the orientation of the field with respect to North (identified as either true or magnetic North).

## D. SAFETY RECOMMENDATIONS

According to the product labels, amitraz is corrosive, causes irreversible eye damage on contact with eyes, and is harmful if absorbed through the skin or inhaled. Repeated skin contact may cause an allergic reaction.

Monitoring personnel should use proper protective equipment to prevent exposure to the vapors or spray mist. According to the product labels, proper protective equipment for applicators includes Tyvek® coveralls over long-sleeved shirt and long pants, chemical

resistant gloves (such as barrier laminate or viton), chemical resistant footwear plus socks, protective eyewear, chemical-resistent headgear for overhead exposure, and a cartridge respirator equiped with a filter cartridge approved for use with pesticides. Monitoring personnel should refer to the label of the actual product used for further precautions.

## E. REFERENCES

Kelley, K. and N.R. Reed. 1996. Pesticides for evaluation as candidate toxic air contaminants. Department of Pesticides Regulation. Sacramento, California. Report No. EH 96-01.

Royal Society. 1993. Amitraz. Agrochemicals Handbook, 3rd edition, Royal Society of Chemistry, London.